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Lead Scientist's Report

Summary: This report includes six items: (1) Summary of one article from *Science* on designing functional flows in the Lower Mekong Basin; (2) Summary of one article from *Science Advances* on media coverage of extreme drought events; (3) The 2018 Delta Science Plan review and update; (4) Summary and highlights from the Managed Relocation Symposium; (5) Announcement of the upcoming Interagency Ecological Program Annual Workshop; and (6) the By the Numbers Report.

Designing River Flows to Improve Food Security Futures in the Lower Mekong Basin. Sabo, J. L.; Ruhi, A.; Holtgrieve, G. W.; Elliott, V.; Arias, M. E.; Ngor, P. B.; Räsänen, T. A.; Nam, S. *Science*, 358. December 8, 2017.

The Lower Mekong Basin (LMB) provides food security for China, Myanmar, Lao People's Democratic Republic, Thailand, Vietnam, and Cambodia. Additionally, more than 60 million people in the area rely on the Mekong River for renewable hydropower energy. While both are crucial for the region's livelihood and economic stability, hydropower development threatens fisheries because seasonal rains that would normally flood the river's floodplains and delta are held in reservoirs. In addition to threatening important fish species, the alteration of the LMB's hydrology promotes invasions of non-native species, changes the system's food web, and reduces biodiversity. Current dam operations change the magnitude, frequency, and variability of river discharge by reducing peak flows and delivering higher base flows, a substantial change from the traditional and highly variable flood pulse system.

Similar to work that has been done in the Sacramento-San Joaquin Delta, researchers investigated the characteristics of functional flows that are beneficial for fish in the LMB. To determine which flow features have the greatest impact on the region, researchers examined: 1) past hydrologic changes and variability; 2) the influence of hydrologic variation on fishery catches; and 3) projected fishery catches under current and designed flow scenarios. They used results from both the historic data and the projected model results to evaluate how those flow features could be translated into management actions to balance tradeoffs for fishery production and hydropower generation.

Unsurprisingly, the researchers identified that the size of the flood pulse was correlated with increased fish catch, but they also found that catch was greater with long, low-flow periods (called interflood interval) followed by short, strong peaks in flow. They used this insight to model four potential hydrologic regimes and found that the "designed flows" with long interflood intervals and short, strong flood pulses, produced a 76 percent increase over current yields. When managing flood pulse systems, it is important to understand when water is needed most and when it can be spared. While there are many parallels that can be drawn between this study of functional flows in the LMB and those in the Delta, it is important to note that the fish in the tropical LMB are not as

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sensitive to water temperature, as are many of the species of interest in the Delta, such as salmonids.

Changes in Water Consumption Linked to Heavy News Media Coverage of Extreme Climatic Events. Quesnel, Kimberly; Ajami, Newsha. *Science Advances,* 3: e1700784. October 25, 2017.
California experienced two severe droughts over the last decade: the first from 2007 to 2009 and the second from 2011 to 2015. The 2011-2015 drought received unprecedented news coverage. In contrast, the first, while also record-breaking and severe, received relatively minimal news coverage. In this article, researchers investigated if the amount of drought news coverage affected the water-use behavior of residents in San Francisco Bay-Area.

This study reviewed media data from 2005 to 2015 and found that as the amount of drought-related news media increased, so did public interest in drought. Next, the researchers compared news coverage to water-use data from Bay-Area single-family residential water users. As the amount of drought-related news media increased, water use decreased. For example, an increase of 100 drought-related news articles was associated with a decrease in water use of up to 18 percent during the 2011-2015 drought.

The first declaration of statewide drought emergency (in modern California history) was issued in 2009 due to the 2007-2009 drought. In 2014, California's governor declared another drought emergency, followed by the state's first-ever mandatory water-use restrictions in 2015. The goal of this study was not to examine the effects of the water-use restrictions, and researchers found that there was a reduction in water use as news coverage intensified prior to the 2015 mandate.

These preliminary findings highlight the relationship between public awareness and water-use behavior. Conservation campaigns can incorporate this research into water-use reduction strategies, and future studies can investigate how the news media affects behaviors of commercial, industrial, and institutional sectors. Another next step would be to explore how social media outlets affect water-use trends.

The 2018 Delta Science Plan Review and Update
The Delta Science Plan, which fulfills a recommendation in the Delta Plan (GR 1), was completed in November 2013. It addresses the need for a framework to guide collaborative approaches to develop and communicate shared scientific knowledge that informs policy, management, and the public, resulting in effective action in the Delta. The Delta Science Plan is a shared guidance document and proposes mechanisms to promote ways to conduct science in an open and transparent manner that supports the many programs addressing Delta issues.

Similar to the Delta Plan, the Delta Science Plan calls for a review and update every five years. Minor updates were made to the document in 2016, including modifications in

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language and additions of two appendices (on research funding policies and potential conflict of interest). The 2018 review and update will be more comprehensive and include potential additions and removal of actions, as well as general revisions throughout the Plan. This review process also provides an opportunity to identify accomplishments and advancements since the release of the original Delta Science Plan. Concurrent to the Delta Science Plan update, the Delta Plan will also be undergoing its five-year review and the Delta Science Program will coordinate activities with the Council's planning and executive divisions.

One important goal of this effort is to complete the update of the Delta Science Plan using an open and transparent process. With leadership from the Delta Science Program, the Delta science community at large will be invited to participate in the process to assist with identifying additional actions and providing any modifications that can improve the Delta Science Plan. Early outreach involving collaborative groups in the Delta (e.g., Interagency Ecological Program (IEP), Collaborative Adaptive Management Team, Delta Agency Science Workgroup) will take place during January and February to discuss the update process and receive initial feedback on overarching recommendations. In late-March/early-April, a public workshop will be held to receive more detailed input, followed by a public review period of the draft document, the Delta Independent Science Board will also review the updated Delta Science Plan, and a final document is anticipated to be presented to the Council in December 2018.

Summary of "Managed Relocation under a Changing Climate" Symposium
As global climate conditions change at an increasingly rapid pace, some species are able to adjust to new conditions and some are able to move to more suitable environments; however, for many species neither of these are possible. This issue has raised the question of managed relocation, a highly debated management approach of moving individuals to a new location anticipated to be more suitable under future conditions than their current location. On Dec. 4, 2017, the UC Davis Coastal and Marine Sciences Institute (CMSI) in conjunction with the Delta Science Program, hosted a one-day symposium that touched on scientific, economic, ethical, and legal considerations of managed relocation under a changing climate. The symposium consisted of 10 talks followed by break-out discussions, where participants discussed paths forward and challenges for managed relocation in different systems (terrestrial, estuarine, freshwater, and marine).

While the talks and discussions were diverse, some common questions and issues where raised throughout the day, including:

- How will translocation of a species outside of their historic range in response to climate change address or resolve the original problems of species?
- What level of assessment of factors is needed, both in regards to the species being relocated and resident species potentially impacted by the translocation, to understand the risk?

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- How do you balance the economic costs and benefits of managed relocation with the environmental costs and benefits?
- What are the consequences of delaying a relocation?
- How does terminology (e.g., assisted migration vs. managed relocation vs. reciprocal transplant) affect the ease of the permitting process and resultant management actions?

Videos of the speaker presentations are available on CMSI's webpage: http://ats.ucdavis.edu/ats-video/?kpid=0_1fqf4n3g.

Upcoming Interagency Ecological Program Annual Workshop
On March 6-8, 2018 the IEP will host its annual workshop at the Lake Natoma Inn in Folsom, CA. The IEP is a collaborative effort of nine member agencies working together to develop a better understanding of Bay-Delta ecology. The three-day workshop is intended for scientists and managers interested in learning about new research results and technical analyses that advance the understanding of topics important to the IEP and the larger Delta science community. This year's workshop will consist of 15 sessions on topics such as Delta landscapes and the human dimension as well as the future of the Bay-Delta science enterprise. There will also be two poster sessions.

Workshop participants interested in presenting a poster have until Feb. 6, 2018 to submit abstracts to Sakura Evans: Sakura.Evans@Wildlife.ca.gov.

To register for the event and/or view the save the date flyer and draft agenda, please visit IEP's event webpage: http://www.cvent.com/events/2018-iep-annual-workshop/event-summary-b68ed672ac5647eb8e8143c4a7df18e3.aspx?i=49d6d8b6-e10a-4160-b3fe-0e9d6637058a

By the Numbers
Delta Science Program staff will give a summary of current numbers related to Delta water and environmental management. The summary (Attachment 1) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

List of Attachments

Attachment 1: By the Numbers Summary (*report to be provided at the Council Meeting*)

Contact

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